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ABSTRACT

To investigate the relationship between performance on a word association test and on a reversal/nonreversal shift discrimination task, institutionalized educable mentally handicapped children were tested. The study did not confirm the hypothesis that children who show evidence of rule-mediated performance on the word association test should also show evidence of learning a reversal shift faster than a nonreversal shift. The report was the second part of an interim research report project for Health, Education, and Welfare, (the first part dealt with establishing a conservation as a reliable tool for specifying the level of functioning). Document EC 031 244 outlines the methodology research conducted before testing. (CD)

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Reversal-Nonreversal Shift

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Austin Texas

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Abstract

This study sought to investigate the relationship between performance on a word association test and on a reversal non-reversal shift discrimination task for institutionalized educable mentally retarded children. The hypothesis was that children who show evidence of rule-mediated performance on the word association test should also show evidence of mediation on the discrimination task--that is, they should learn a reversal shift faster than a non-reversal shift. Results of the study did not confirm the above hypothesis. The only statistically reliable result was that position as a cue was easier to learn than color.

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Introduction

It is suggested by a number of researchers (Moran, 1968; Entwhistle, 1966) that shifts in a child's word associations over time mirror his sequence of cognitive development. Moran indicates that there is a hierarchical ranking of response sets on the word association test in terms of linguistic sophistication (1966). These "response sets" may index some alternative ways in which words are associated in the S's lexicon. The hierarchy of increasing maturation suggested by Moran is Perceptual referents (predicate associates); Object-referents (functional associates); Concept-referents (synonyms and superordinates); and Dimension-referents (coordinates and contrasts). There are difficulties with this kind of analysis of word associations, however; for example, word sets in adults have not been found to correlate with IQ or verbal ability (Moran, 1968). For this reason Moran hypothesizes that sets represent the utilization of a rule for performing the word association task, rather than a particular type of association existing between particular words.

The idea of rule-guided responding in a word association task also fits the analysis Enthwhistle (1966) applies to word association performances. Enthwhistle has shown what she refers to as a "syntactic-paradigmatic" shift in word associations given by children. Young children respond with words that might occur near the stimulus word in a sentence; "boy"-"runs", for example, is a "syntactic" relationship. Older children give paradigmatic associates; that is, words that could replace the stimulus word in a sentence; e.g. "boy"-"girl."

In both types of analysis, the major assumption is that word associations change or develop with increasing sophistication or development of linguistic and cognitive abilities. After administering word association tests to a population of retarded children and before drawing conclusions about the linguistic and cognitive development of those children from the test protocols, we desired some additional information about the cognitive development of the Ss in order to validate the above line of reasoning.

One type of task that was chosen as a possibility for yielding this kind of information is the reversal-nonreversal discrimination task. In arriving at this choice, we were struck with several arguments that would not only make the task seem appropriate but that may suggest an alternative hypothesis about the relationship of word associations to overall cognitive development.

Assuming for the moment that performance in the word association task (WAT) is based on the use of a rule, we need to specify the kinds of rules that could be operative. At one extreme might be some sort of sensory responding and at the other a highly mediated type of responding. On the word association task, sensory responding would be reflected in responses that rhyme with the stimulus words or words that begin with the same sound. Responses that could be scored as paradigmatic associates might represent the other extreme since such words are related "meaningfully" to the stimulus. In between the two extremes fits "syntactic" responses. To justify this type of scheme we can try mapping these stages of word association development onto the stages postulated by Piaget for the sequential development of cognitive structures. Stage I is the stage of sensory-motor development which nicely relates to sensory type associates. "Syntactic" responses might be thought of as a kind of linguistic concrete relation, Stage II of Piaget's system. In the concrete stage, the child solves cognitive problems according to operations within a system. He may, for instance, conserve substance but not volume because his rules for problem solution are concretely bound to the situation. In the same way, when asked to give a word in response to a word, he may be limited to "syntactic" rules because those are the rules he has learned to use in forming utterances. Finally, mediated responding may represent linguistically the cognitive stage Formal Operations. The person is able to solve the problem in a number of ways according to the logic following from initial assumptions. His performance on the word association task would then represent, as Moran hypothesizes, the utilization of a particular rule for performing the task, rather than a particular type of association existing between particular words.

In any case, what we most want to know about the word association protocols we have collected is whether a child who fails to give an acceptable number of "scoreable" responses does so because he has not yet developed appropriate, perhaps mediational, rules and so uses sensory rules, or whether his performance is influenced by other factors. The nonreversal task was chosen because performance on that task can be characteristic of "older" or "younger" children. "As Luria has stated:"

> "In the early stages of child development, speech is only a means of communication with adults and other children...Subsequently it also becomes a means whereby the child organizes his own experiences and regulates his own actions. So the child's activity is mediated through words" (1957, p. 116).

Intuitively it seemed to us that a child who responds on the WAT at the "sensory" level, i.e., responds on the basis of the stimulus properties of the word rather than on the basis of its meaning might also respond in a stimulus-bound manner on the reversal-shift task.

The reversal-nonreversal task was chosen because performance on that task has been shown to be age-dependent (Kendler & Kendler, 1926). Younger children, under 5, typically perform a nonreversal shift more easily than a reversal shift while the opposite holds for children over 7. They suggest that the young child may be responding to the stimulus per se rather than to a concept about the properties of the stimulus. They hypothesize that older children employ a rule or "mediate" the solution to the problem on the basis of the property of the stimulus.

Specifically, this line of reasoning would lead to the following hypotheses: Children who give responses on the WAT that are meaningfully related to the stimuli are showing evidence of mediation and thus should perform a reversal shift more easily than a nonreversal shift in the discrimination task. On the other hand children who consistently give no response or non-meaningfully related responses on the WAT are not showing evidence of mediation and thus should perform a non-reversal shift more easily than a reversal shift in the discrimination task.

Method

Subjects. All Subjects (Ss) were residents of the Austin State School for the Mentally Retarded. CA range was 10-14; IQ range, 46-76. Each child had taken a word association test several months previous to this study, and two groups of 16 Ss were selected on the basis of their performance on that test. The "high set" group (g-Hi) was composed of those Ss who had given 75% or more responses on the WAT that could be scored by Moran's system. The "low-set" group (g-Lo) was composed of Ss who had given fewer than 25 out of 40 responses scoreable by Moran's system and whose protocols contained a number of responses that appeared to follow some rule other than set-type rules--rhyming, for instance.

Apparatus. A modified WGTA was used to present colored square blocks as stimuli in a two-choice problem. On each trial the positive cue was either color (white-brown) or position (right-left). In addition to light reinforcers (a white light signaled a correct response, a red light; incorrect) a marble dispenser was attached to one side of the machine and a marble dispensed for each correct choice. The marbles fell into a bowl at Ss right hand making a loud (satisfying) noise. S was also instructed to return a marble to E when he made an incorrect choice. This was accomplished by the S taking a marble from his dish and placing it in a dish on the stimulus tray. The marbles earned were traded for M&M candies at the end of the session.

Procedure. Half of each group was randomly assigned to a reversal condition and half to a nonreversal condition. The four resulting groups were again divided so that half of each learned color and half position cues in the block of test trials. Thus there were 8 groups of 4 each in a 2 (levels of set) x 2 (reversal conditions) x 2 (cues to learn) factorial design. Instructions were as follows:

"Today we're going to play a game with these blocks When the tray comes out like this (demonstrate), these two blocks will always be on it. One block will be the right one each time and one will be the wrong one. Your job is to decide which block is the right one each time. The way you'll know whether you've decided on the correct block is that when you pick up the block you've decided is the right one a light will come on like this (demonstrate). If the light is white, you've chosen the right one if the light is red, then you've chosen the wrong block. OK? Every time you choose the right block I'll give you a marble, like this (demonstrate) It will fall into that dish and you can leave it there. When we're through playing, you can trade your marbles in for some candy. OK? But there's one catch. Every time you choose the wrong block and the red light comes on, you have to give me a marble by taking it out of your dish and putting it in this little dish for me. So, you see you'll want to get as many right as you can so that you'll have lots of marbles to trade for candy. Do you understand all of that? Ok, do good."

Each S was seen once. The block of training trials continued until S made 8 consecutive correct choices. The reversal/nonreversal test trials continued until S again made 8 consecutive correct responses or until 80 trials were concluded. The dependent measure was the number of errors to criterion in the test block.

Results

The analysis is summarized in Tables 1 and 2. Position was an easier cue to learn than color in the transfer task regardless of the cue that had been reinforced during original training. This difference was significant at the .05 level. No other main effects and no interactions were significant. Findings tended, however, toward support of conclusions opposite those we expected. Nonreversal learning appeared to be more difficult for the Lo-set group and reversal learning more difficult for the Hi-set group.

Since performance on this type of task is usually age related, and since no significant differences were found in the first analysis, the data were regrouped so that main effect B represented Hi and Lo-IQ groups rather than Hi-and Lo-set groups. Hi-Lo group was composed of those Ss with measured IQ (WISC scores) greater than 59. Lo-IQ Ss had measured IQ's of 59 or below. Analysis of the data thus grouped is summarized in Tables 3 and 4. Again, position was significantly easier to learn than color ($p < .05$), and there were no other significant effects. Both the reversal and nonreversal tasks were easier for Ss with high IQ's, so there was no interaction.

Discussion

There is no support in the results of the present study for the hypotheses we wanted to test. In fact, the data appear to be irrelevant for drawing conclusions about possible differences in problem-solving strategies for Hi-and Lo-set responders on a WAT. The results do, however, suggest some things about the reversal-nonreversal problem for retarded Ss.

Investigations of a possible relationship between intelligence and learning differences in a reversal-nonreversal task have not resulted in the kind of information from which clear conclusions can be drawn. For the learning of a reversal shift some have found normal learning superior to retardate learning (of the same MA). (Bryant, 1964; Balla & Zigler, 1964). Others find no differences (Stevenson & Zigler, 1957; Milgram & Furth, 1964) or that retardate learning is superior to normal learning (O'Conner & Hermelin, 1959). The same kind of confusing results has been found with regard to ease of learning a nonreversal shift (Stevenson & Zigler, 1957; Sanders et al, 1965; Iwahara & Sugimura, 1962). In summarizing these studies, Wolff (1967) also notes that original learning is about equal for retarded and normal populations (Heal, Ross & Sanders, 1966; Sanders et al, 1965). The differences observed above cannot be attributed to differences in the amount of original training or the probability with which the S attends to the relevant cue or dimension at the end of original learning. One explanation of retardate learning in the transfer task that is suggested in the results of the present study is that upon receiving disconfirmation of their previous reinforced hypothesis, retarded Ss reject all information acquired up to that point and begin anew--a stimulus-sampling kind of behavior. Piaget (1952) and others note that it is characteristic of younger children to solve each new problem as if it were independent of previous problems. Learning to conserve "absolute" number does not apparently transfer to problems that require conservation of "relative" number even when the problems are presented successively (Wohlwill & Lowe, 1962). Retardates then, may respond to the transfer trials in that younger fashion, treating the problem as if it were new. This explanation of their performance seems incomplete at best, however, since the number of trials to criterion on the transfer task was greater than the number of trials to criterion on the transfer task was greater than the number of trials to criterion on the training block. In fact, some children never learned the transfer task, but had no such difficulty in original learning.

A more likely explanation is motivational. Retarded children have a large amount of failure experience and so mistrust their solutions to problems (Zigler, 1969). In the present case, disconfirmation of his hypothesis may have been a rather distinct failure experience for the retardate. This may have caused him not only to throw out all information already acquired and thus start sampling anew, but perhaps also to avoid the whole task situation--resulting in further impairment of his performance.

Finally, position was an unfortunate choice on our part as a cue, since it is so salient that it is sampled first--regardless of the Ss previous experience in the task situation.

References

Bella, D. & Zigler, E. Discrimination and switching learning in normal familial retarded, and organic retarded children. Journal of Abnormal and Social Psychology, 1964, 69, 664-669.

Bryant, P. E. The effect of a verbal instruction on transfer in transfer in normal and severely subnormal children. Journal of Mental Deficiency Research, 1964, 8, 35-43.

Entwisle, D. R. Word Association of Young Children. Baltimore: John Hopkins University Press, 1966.

Heal, L. W., Ross, L. E., and Sanders, B. Reversal and partial reversal in mental defectives and normal children of a comparable mental age. American Journal of Mental Deficiency, 1966, 71, 411-416.

Iwahara, S. & Sugimura, T. The effect of different amounts of training upon shifted discrimination learning as a function of intellectual level. Psychologia, 1962, 5, 93-98.

Kendler & Kendler, T. S. Vertical and horizontal processes in problem solving. Psychological Review, 1962, 69, 1-16.

Luria, A. R. The role of language in the formation of temporary connections. In B. Simon (Ed.) Psychology in the Soviet in Union. Stanford: Stanford University Press, 1957, p. 115-129.

Milgram, N. A. & Furth, H. F. Position reversal versus dimensions reversal in normal and retarded children. Child Development, 1964, 35, 701-708.

Moran, L. J. Generality of word-association response sets. Psychological Monograph, 1966, 80, No. 612. (a)

Moran, L. J. The word association process and idiodynamic sets. Mimeographed Department of Psychology, The University of Texas, 1968.

O'Connor, N. & Hermelin, B. Discrimination and reversal learning in imbeciles. Journal of Abnormal and Social Psychology, 1959, 59, 409-413.

Piaget, J. The origins of intelligence in children (Trans. by M. Cook). (Originally published 1936) New York: International Universities Press, 1952.

Sanders, B., Ross, L. E. and Heal, L. W. Reversal and nonreversal shift learning in normal children and retardates of comparable mental age. Journal of Experimental Psychology, 1965, 69, 84-88.

Stevenson, H. W. & Zigler, E. Discrimination learning and rigidity in normal and feebleminded individuals. _Journal of Personality_, 1957, _25_, 699-711.

Wohlwill, J. F. & Lowe, R. C. Experimental analysis of the development of the conservation of number. _Child Development_, 1962, _33_, 153-167.

Wolff, J. L. The effects of verbalization and pretraining on concept attainment by children in two mediation categories. _Journal of Educational Psychology_, 1967, _58_, 19-26.

Zigler, E. Familial mental retardation: A continuing dilemma. _Science_, 1967, _155_, 292-298.

Table 1

Means for Subjects Grouped by High and Low Set,
(Trials to Criteria)

/	High Set	Low Set	Grand Means
Reversal	12.5	10.4	11.4
Non Reversal	7.3	19.5	13.4
Grand Means	9.9	15.0	

Grand mean for position=6.9
Grand mean for color=17.8

Table 2

Analysis of Variance for Data Grouped by High and Low Set, (Trials to Criteria)

Source	df	MS	F	Needed .05	Needed .01
Total	31				
BG	7	255.56	1.32	2.43	3.50
A	1	30.03	0.15	4.26	7.82
B	1	205.03	1.06		
C	1	913.78	4.72		
AxB	1	413.28	2.13		
AxC	1	16.53	0.08		
BxC	1	5.28	0.02		
AxBxC	1	205.04	1.06		
WG	24	193.34			

A = R-NR task
B = Hi-Lo set
C = Color-Position cue

Table 3

Means for Subjects Grouped by High and Low IQ
(Trials to Criteria)

	High IQ	Low IQ	Grand Means
Reversal	6.5	16.4	11.4
Non Reversal	8.8	18.0	13.4
Grand Means	7.6	17.2	

Grand mean for position=7.1
Grand mean for color=17.8

Table 4

Analysis of Variance for Data Grouped by High and Low IQ (Trials to Criteria)

Source	df	MS	F	Needed .05	Needed .01
Total	31				
BG	7	255.56	1.32	2.43	3.50
A	1	30.03	0.15	4.26	7.82
B	1	205.03	1.06		
C	1	913.78	4.72		
AxB	1	413.28	2.13		
AxC	1	16.53	0.08		
BxC	1	5.28	0.03		
AxBxC	1	205.04	0.02		
WG	24	193.34	1.06		

A = R-NR task
B = Hi-Lo set
C = Color-Position cue